AMENDMENTS TO THE SPECIFICATION

Please replace paragraph [0014] with the following rewritten paragraph [0014]:

[0014] In the above mentioned optical signal processing method, the optical encoders are preferably "N" optical encoders each having an input-to-output characteristic with a period of $\cancel{T/2^{(N-2)}}$ $T \times 2^{(N-2)}$, where "N" is a natural number (N = 1, 2, 3...) indicating a quantifying bit number.

Please replace paragraph [0018] with the following rewritten paragraph [0018]:

[0018] According to the fifth aspect of the present invention, there is provided an optical signal processing device including a signal processing ~~means~~ device for performing predetermined signal processing on a pulse train of signal light having a first wavelength according to control light having a pulse train having a second wavelength different from the first wavelength, by using an optical signal processor including an optical nonlinear device having an input-to-output characteristic with predetermined periodicity with respect to light intensity, and for outputting a resultant signal light.

Please replace paragraph [0019] with the following rewritten paragraph [0019]:

[0019] According to the sixth aspect of the present invention, there is provided an optical signal processing device including an operating ~~means~~ device for performing predetermined optical logic operation processing on a pulse train of signal light having a first wavelength, by making use of one of (a) a plurality of control lights each having a pulse train having a second wavelength different from the first wavelength and (b) control light having a pulse train having a plurality of wavelengths different from the first wavelength, by using an optical signal processor including an optical nonlinear device having an input-to-output characteristic with periodicity corresponding to a predetermined optical logic operation with respect to light intensity, and for outputting a resultant signal light.

Please replace paragraph [0021] with the following rewritten paragraph [0021]:

[0021] According to the seventh aspect of the present invention, there is provided an optical signal processing device including an optical encoding ~~means~~ device for optically encoding a pulse train of signal light having a first wavelength according to control light which has a second wavelength different from the first wavelength and a pulse train of an optically sampled optical analog signal, by using a plurality of optical encoders each of which includes optical nonlinear devices having input-to-output characteristics with different periodicities with respect to light intensity, respectively, and for outputting a plurality of pulse trains of optically-encoded signal light from the respective optical encoders.

Please replace paragraph [0022] with the following rewritten paragraph [0022]:

[0022] In the above mentioned optical signal processing device, the optical encoders are preferably "N" optical encoders each having an input-to-output characteristic with a period of ~~$T/2^{(N-2)}$~~ $T\times2^{(N-2)}$, where "N" is a natural number (N = 1, 2, 3...) indicating a quantifying bit number.

Please replace paragraph [0023] with the following rewritten paragraph [0023]:

[0023] According to the eighth aspect of the present invention, there is provided an optical signal processing device including a multi-level decoding ~~means~~ device for decoding a pulse train of a multi-level optical signal having a first wavelength into a plurality of binary optical signals according to control light having a pulse train having a second wavelength different from the first wavelength, by using a plurality of optical signal processors including optical nonlinear devices having input-to-output characteristics with different periodicities with respect to light intensity, and for outputting the binary optical signals.

Please replace paragraph [0028] with the following rewritten paragraph [0028]:

[0028] In addition, in the above mentioned optical signal processing method, the optical encoders are preferably "N" optical encoders each having an input-to-output characteristic with a period of ~~$T/2^{(N-2)}$~~ $T\times2^{(N-2)}$, where "N" is a natural number (N = 1, 2, 3...) indicating a quantifying bit number.

Please replace paragraph [0035] with the following rewritten paragraph [0035]:

[0035] According to the tenth aspect of the present invention, there is provided an optical signal processing device for optically analog-to-digital-converting an optically sampled optical analog signal into an optical digital signal. The device includes an optically encoding ~~means~~ device and an optically quantizing ~~means~~ device. The optically encoding ~~means~~ device optically encodes a pulse train of signal light having a first wavelength according to control light which has a second wavelength different from the first wavelength and has a pulse train of an optically sampled optical analog signal, by using a plurality of optical encoders each including optical nonlinear devices having input-to-output characteristics with different periodicities with respect to the light intensity, and outputs a plurality of pulse trains of optically-encoded signal light from the respective optical encoders. The optically quantizing ~~means~~ device performs optical threshold processing on the pulse trains of optically-encoded signal light to optically quantize the pulse trains of optically-encoded signal light, by using at least one of optical threshold processors each of which is connected to each of the optical encoders and includes a nonlinear optical device having a nonlinear input-to-output characteristic with respect to light intensity, and outputs optically quantized pulse trains as optical digital signals.

Please replace paragraph [0036] with the following rewritten paragraph [0036]:

[0036] The above mentioned optical signal processing device preferably further includes an optically sampling ~~means~~ device for optically sampling an optical analog signal at a

predetermined sampling frequency, and for outputting an optically sampled optical analog signal, at the previous stage of the optically encoding ~~means~~ device.

Please replace paragraph [0037] with the following rewritten paragraph [0037]:

[0037] In addition, in the above mentioned optical signal processing device, the optical encoders are preferably "N" optical encoders each having an input-to-output characteristic with a period of ~~$T/2^{(N-2)}$~~ $T\times2^{(N-2)}$, where "N" is a natural number (N = 1, 2, 3...) indicating a quantifying bit number.

Please replace paragraph [0044] with the following rewritten paragraph [0044]:

[0044] According to the eleventh aspect of the present invention, there is provided a nonlinear optical loop mirror including an optical fiber, a photo-coupler, a control-light input ~~means~~ device for inputting a control light signal to the optical fiber, and a nonlinear medium placed on an optical path of the optical fiber. The photo-coupler is connected so as to branch an input optical signal inputted from an optical-signal input end into two optical signals and to output the optical signals to both ends of the optical fiber and connected so as to branch and output optical signals outputted from the both ends of the optical fiber to the optical-signal input end and an optical-signal output end, respectively. The nonlinear optical loop mirror adjusts a phase difference between optical signals inputted to the both ends of the optical fibers according to power of the control light signal so as to control power of the output optical signal outputted from the optical-signal output end. The nonlinear optical loop mirror suppresses a parametric gain caused among the respective branched optical signals and the control light signal, so that a ratio of the power of the output optical signal to the maximum value thereof becomes equal to or smaller than a predetermined threshold value when a difference between phase shifts caused to the respective branched optical signals is set to $2n\pi$ (where "n" is an integer equal to or larger than 1), where the phase shifts are caused by cross-phase modulation (XPM) generated among the respective branched optical signals and the control light signal.

Please replace paragraph [0058] with the following rewritten paragraph [0058]:

[0058] According to the twelfth aspect of the present invention, there is provided a nonlinear optical loop mirror including an optical fiber, a photo-coupler, a control-light input ~~means~~ device for inputting a control light signal to the optical fiber, and a nonlinear medium placed on an optical path of the optical fiber. The photo-coupler is connected so as to branch an input optical signal inputted from an optical-signal input end into two optical signals and to output the optical signals to both ends of the optical fiber and connected so as to branch and output optical signals outputted from the both ends of the optical fiber to the optical-signal input end and an optical-signal output end. The nonlinear optical loop mirror adjusts a phase difference between optical signals inputted to the both ends of the optical fibers according to power of the control light signal so as to control power of the output optical signal outputted from the optical-signal output end. A dispersion characteristic of the nonlinear medium has a normal dispersion characteristic, at a wavelength of the control light signal.

Please replace paragraph [0061] with the following rewritten paragraph [0061]:

[0061] According to the thirteenth aspect of the present invention, there is provided a nonlinear optical loop mirror including an optical fiber, a photo-coupler, a control-light input ~~means~~ device for inputting a control light signal to the optical fiber, and a nonlinear medium placed on an optical path of the optical fiber. The photo-coupler is connected so as to branch an input optical signal inputted from an optical-signal input end into two optical signals and to output the optical signals to both ends of the optical fiber and connected so as to branch and output optical signals outputted from the both ends of the optical fiber to the optical-signal input end and an optical-signal output end. The nonlinear optical loop mirror adjusts a phase difference between optical signals inputted to the both ends of the optical fibers according to power of the control light signal so as to control power of the output optical signal outputted from the optical-signal output end. A difference between phase shifts caused to the respective optical signals, due to cross-

phase modulation (XPM) caused between the respective optical signals and the control light signal, is equal to or larger than 2π.

Please replace paragraph [0065] with the following rewritten paragraph [0065]:

[0065] According to the fourteenth aspect of the present invention, there is provided a method for designing a nonlinear optical loop mirror including an optical fiber, a photo-coupler, a control-light input ~~means~~ device for inputting a control light signal to the optical fiber, and a nonlinear medium placed on an optical path of the optical fiber. The photo-coupler is connected so as to branch an input optical signal inputted from an optical-signal input end into two optical signals and to output the optical signals to both ends of the optical fiber and connected so as to branch and output optical signals outputted from the both ends of the optical fiber to the optical-signal input end and an optical-signal output end. The nonlinear optical loop mirror adjusts a phase difference between optical signals inputted to the both ends of the optical fibers according to power of the control light signal so as to control power of the output optical signal outputted from the optical-signal output end. The method includes first, second, third, fourth, and fifth steps. The first step determines a transfer function and a period (ϕ_{max}) of the transfer function, the transfer function being expressed as a relationship of power of an input optical signal with respect to power of an output optical signal. The second step determines a threshold value of the output optical signal suitable for optical signal processing. The third step provisionally determines a nonlinearity constant and a dispersion characteristic of said nonlinear medium, and a wavelength and a peak power of the control light signal. The fourth step judges whether or not a phase shift reaches the period ϕ_{max}, and proceeds to the fifth step when the phase shift reaches the period ϕ_{max}, while returns to the third step when the phase shift does not reach the period ϕ_{max}. The fifth step judges whether or not a relationship of G<2Tth+1 is satisfied, where "G" is a ratio of amplification of the optical signal propagating in the same direction as that of the control light signal, where the amplification is caused by the parametric gain, and "Tth" is a ratio of the predetermined threshold value to the maximum value of the output optical signal, and sets the nonlinearity coefficient and the dispersion characteristic of the

nonlinear medium and the wavelength and the peak power of the control light signal which have been provisionally determined to a designing determined value when the relationship is satisfied, while returns to the third step when the relationship is not satisfied.

Please replace paragraph [0079] with the following rewritten paragraph [0079]:

[0079] In addition, a further optical fiber cable 19 is arranged proximally to an optical fiber in the nonlinear optical loop mirror 10 near the terminal T21 of the photo-coupler 11 so that these optical fiber cables are optically coupled to each other, so as to form a photo-coupler 12 around their portions which are arranged proximally to each other. As shown in Fig. 3, the following terminals are defined in the photo-coupler 12:

(1) a terminal on the optical fiber cable 19 near its one end for inputting control light is defined as T31;

(2) a terminal on the nonlinear optical loop mirror 10 near the terminal ~~T2~~ T21 of the photo-coupler 11 is defined as T32;

(3) a terminal on the optical fiber cable 19 near another end is defined as T41; and

(4) a terminal on the nonlinear optical loop mirror 10 closer to another end of the nonlinear optical loop mirror 10 (closer to the terminal T22) than the terminal ~~T2~~ T21 of the photo-coupler 11 is defined as T42.

Please replace paragraph [0092] with the following rewritten paragraph [0092]:

[0092] Fig. 5 is graphs and a block diagram showing an exemplary operation of the optical encoding circuit 200 of Fig. 3. In Fig. 5, the respective optical encoders 201, 202 and 203 have period characteristics of the power level of output signal light with respect to the power level of input control light different from each other, respectively. In particular, there is shown such a case where there is the relationship of power-of-two among their periods, the optical encoder 201 has a period of "2T", the optical encoder 202 has a period of "T", and the optical encoder 203 has a period of "T/2". In the

exemplary operation of Fig. 5, the signal light inputted at a timing t_1 is encoded by the optical encoders 201, 202 and 203, then quantized by the optical threshold processors 301, 302 and 303 (this will be described in detail later), and is outputted as an optical digital signal indicative of a 3-bit codes of "001". Further, in order to obtain an optical digital signal indicative of N-bit codes, it is necessary to provide "N" optical encoders each having an input-to-output characteristic with a period of ~~$T/2^{(N-2)}$~~ $\underline{T\times 2^{(N-2)}}$ with respect to the light intensity. In this case, "N" is a natural number indicating a quantifying bit number.

Please replace paragraph [0181] with the following rewritten paragraph [0181]:

[0181] Referring to Fig. 57, the optical logic operation circuit 600 is constructed by including an optical signal processor 601 and a 3 dB photo-coupler 602. In this case, the optical signal processor 601 is constructed by including the NOLM 10, the two photo-couplers 11 and 12, the optical isolator 13, the two optical band-pass filters 14 and 14A, then optical isolator 18, the optical fiber cable 19, an optical circulator 16A, and a signal light pulse source 603, in a manner similar to that of the optical encoder 201 of Fig. 3. Signal light pulses from the signal light pulse source 603 are inputted to the optical fiber cable of the NOLM 10 of the optical signal processor 601 via the optical circulator 16A. In this case, two pulse trains of binary signals "x" and "y", which are input signals for the optical logic operation, are combined with each other by the photo-coupler 602, and thereafter, a combined signal is inputted to the NOLM 10 of the optical signal processor 601 via the optical isolator 18, the optical fiber cable 19, and the photo-coupler 12. Then, the combined signal is combined with the above mentioned signal light pulses in the NOLM 10, subjected to the above mentioned nonlinear optical processing, and thereafter, a processed optical signal is outputted as an optical signal resulted from a first operation from the photo-coupler 11 via the optical band-pass filter 14, and the processed optical signal is outputted as an optical signal resulted from a second operation from the photo-coupler 11 via the optical isolator 16A and the optical band-pass filter ~~14~~14A.